**Describe the System Including any Changes Resulting from Risk Analysis (took this from SDD summary, need to include CHANGES from risk analysis)**

The General Low Voltage Power Supply (GLV) for the Aztec Electric Racing (AER) vehicle is a Printed Circuit Board (PCB) enclosed in a modular, compact, fireproof, waterproof, and easy to assemble/disassemble enclosure. The purpose of the GLV is to supply power to all onboard low voltage electronics on the AER vehicle via the use of an onboard low voltage battery pack. To achieve this, the PCB will be divided into five main circuits: battery management system (BMS), DC input for recharging the cells of the battery pack, dual voltage DC output, user interface (UI), and information logging. The BMS mainly consists of a microcontroller in the form of an ESP32 from the Wrover family of products and a BMS IC from the TI-BQ769x0 family which will handle cell balancing and battery protection features. The DC input will be handled by an ACDC wall power adapter which brings power to the PBC via a barrel jack. The dual voltage DC output will be handled by DC-DC converter that will create two voltage rails, 12V and 24V, the rails will be able to deliver up to 5A and 10A respectively. The UI will consist of a display and momentary switch on the front of the GLV. The display will give the user information regarding battery performance and system power draw. The user will be able to request the logging of system information via the momentary switch located on the front of the GLV. The logs will be written to an onboard SD card as a .csv file for the user to be able to review later. The following sections of this document cover functionality, inputs & outputs, use case, physical description & UI, development versus procurement, specifications, and validation in detail.

**Provide Operational and Physical Description of the Device (took this from use case from SDD)**

**Operational/Use Case:**

The GLV for AER’s Formula Electric Race Car (FERC) is being developed to power all low voltage electronics on the vehicle (vehicle dashboard, PCM, etc). Prior to our project, there was an existing model, however, it was very inconvenient in many aspects for AER. For example, there were rechargeable batteries, however, in order to recharge them it required the team to physically remove the power supply from the car, desolder wires and finally hook it up to a bench-top power supply. This is not very practical, as a power adapter would be more efficient for rechargeability, allowing the racers to plug the power supply into the wall when charging is needed. With practicality in mind, the design should not have to be tampered with in order to perform essential functions such as charging. In past competitions, the power supply used buzzers to indicate it was “on” and functioning correctly, with no method of collecting how effective/efficient the batteries were working together. For testing purposes, the chassis will include a display providing information about the batteries, such as temperature, voltage, and current output. In addition to displaying information, there will be an micro-SD Card that will store the data in the form of a .csv file. By collecting data, the user is able to analyze the performance and state of the vehicle. This can be accomplished by comparing the data after each race to ensure compliance with discharging/charging protocols and sufficient temperature ranges

**Brief System Test Procedure/Plan**

For our GLV, there will be two types of system tests, one utilizing a terminal display, and the other showcasing a LCD screen. The first test will be used to ensure the

Terminal Display (put put GLV in racecar)

1. Charge system for “x amount of time” using power adapter
2. Turn system on by plugging in “port supply DC”
3. Connect system to PuTTY (via laptop) through \_\_\_\_\_\_\_ (interface)
4. Listen to buzzer sound (indication it has successfully booted up)
5. Flip the momentary switch for data logging
6. PuTTY should display battery temperature, battery voltage, current output
7. Run system for “x amount of time”
8. Will save in the form of a .xlsx file on the SD card
9. Insert SD card into laptop to check saved log

LCD Screen (put put glv in racecar or no)

1. Charge system for “x amount of time” using power adapter
2. Turn system on by plugging in “port supply DC”
3. Listen to buzzer sound (indication it has successfully booted up)
4. Flip the momentary switch for data logging
5. LCD Screen should display battery temperature, battery voltage, current output
6. Run system for “x amount of time”
7. Will save in the form of a .xlsx file on the SD card
8. Insert SD card into laptop to check saved log